DAGSI Research Topic

1. **Research Title:** Wide-aperture nonlinear and nonreciprocal multilayers for optical switching, limiting, isolation, and enhanced light detection.

2. **Individual Sponsor(s):**

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3. **Academic Area/Field and Education Level**

   Physics or Electrical Engineering (M.S. or Ph.D. level)

4. **Objectives:** Design, fabrication, and testing of dielectric and metal-dielectric multilayer structures involving nonlinear, phase-changing, and magneto-optical components for free-space beam control. This includes but is not limited to: control of light polarization and direction of propagation, control of pulse intensity and/or fluence, resonant and non-resonant enhancement of light detection.

5. **Description:** Depending on the frequency range, the nonlinear materials incorporated into a photonic (layered) structure can be semiconductors (such as GaAs, AlGaAs, lnAs, lnAsSb, etc.), phase changing materials (such as VO2 or GST), ferrites (hexa-ferrites or magnetic garnets), and/or metallic nano-layers. In all cases, the focus is on wide aperture layered structures. When it comes to the control of pulse intensity and fluence, the focus is on the enhancement of the dynamic range, bandwidth, and damage threshold. The control of direction of beam propagation involves design of wide-aperture omnidirectional isolators based on metal-dielectric nonreciprocal multilayers, as well as nonlinear structures with highly asymmetric transmission. Nonreciprocal multilayers used for omnidirectional isolation should be able to perform without bias magnetic field.

6. **Research Classification/Restrictions:** This is an unclassified basic research project. No security clearance is required, but it may be needed during the project. This project is for U.S. citizens only.

7. **Eligible Research Institutions:** Any State of Ohio Research Institution.

PA Approval # 88ABW-2017-3959